

LUNAR EXPLORATION NEUTRON DETECTOR FOR NASA LRO MISSION. I. G. Mitrofanov¹, A. S. Sanin¹, M. I. Mokrousov¹, M. L. Litvak¹, A. S. Kozyrev¹, A. A. Malakhov¹, V. I. Tretyakov¹, A. V. Vostrukhin¹, V. N. Shvetsov², R. Sagdeev³, W. Boynton⁴, K. Harshman⁴, H. Enos⁴, J. Trombka⁵, T. McClanahan⁵, L. Evans⁶ and R. Starr⁷, ¹Institute for Space Research, Moscow 117997, Russia, ²Joint Institute for Nuclear Research, Dubna, Russia, ³University of Maryland, College Park, USA, ⁴University of Arizona, Tucson, USA, ⁵NASA Goddard Space Flight Center, Greenbelt, ⁶USA, Computer Science Corporation, Greenbelt, USA, ⁷Catholic University, Washington DC, USA.

Introduction: The concept of Lunar Exploration Neutron Detector is presented, which is Russian contributed instrument for NASA's Lunar Reconnaissance Orbiter [1]. The measurements of this instrument will allow to continue studies of neutron emission from the Moon started by Lunar Prospector [2], but with much higher spatial resolutions about 10 km for the orbit with altitude of 50 km.

Instrument objectives: Three main objectives of LEND experiment will be discussed, as the following:

- mapping of hydrogen content over the entire surface of the Moon;
- testing the presence of water ice deposits within polar craters with permanent shadow from sun sight;
- characterization of neutron component of lunar radiation environment.

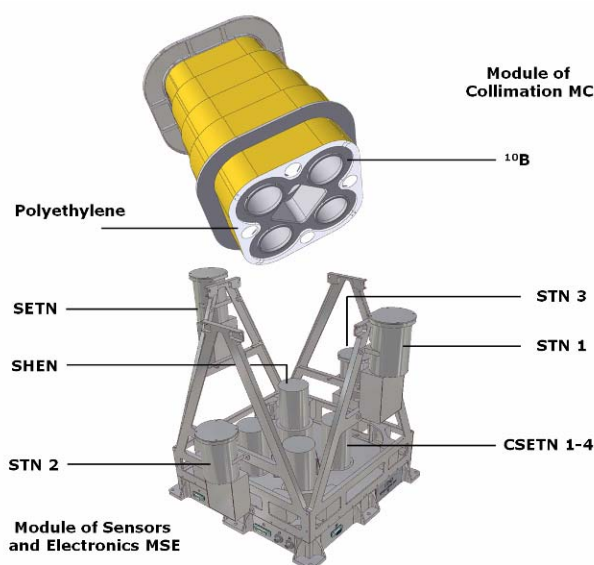


Figure 1. Schematic view of LEND with removed Module of Collimation MC. This module contains the absorbing substance of ^{10}B and layers of polyethylene. Module of sensors and electronics (MSE) has collimated sensors CSETN 1-4 of epithermal neutrons and sensor SHEN of high energy neutrons. It also has four omni-directional sensors of epithermal neutrons SETN and thermal neutrons STN 1 – 3.

Design of the instrument: Design of LEND will be described (Figure 1), as the suite of 9 individual sensors of thermal, epithermal and high energy neutrons. All of them are integrated within the module of sensors and electronics (MSE). Details on neutron module of collimation (MC) will be presented together with results of physical calibrations of its collimation efficiency. Major parameters of flight unit of the instrument will be presented (Figure 2).

Data products from LEND: All four levels of data products will be discussed: from level-0 data with rough counting data up to the level-3 data with maps of hydrogen distribution and estimations quantity or upper limits of water ice deposits. Time schedule to data product development will also be presented.



Figure 2. General view of LEND flight unit

LEND support for LCROSS. The program of LEND data analysis will be presented for creation of the list of the most probable polar regions with water ice deposits.

References: [1] Mitrofanov I.G. et al. (2008) *Astrobiology* v. 8, issue 4, p. 793. [2] Spudis P.D. et al. (1998) *Solar System Research*, v. 32, p. 17.